

CNTT-E-144

**BASIC ELECTRICITY
AND ELECTRONICS**

STUDENT HANDOUT

NO. 307

**SUMMARY
PROGRESS CHECK
AND JOB PROGRAM
FOR MODULE 31-4**

JUNE 1984

SUMMARY
Lesson 4

Video Amplifiers

Many types of electronic equipment which produce a visual display require video amplifiers. The ideal video amplifier should have a frequency response curve resembling Figure 1.

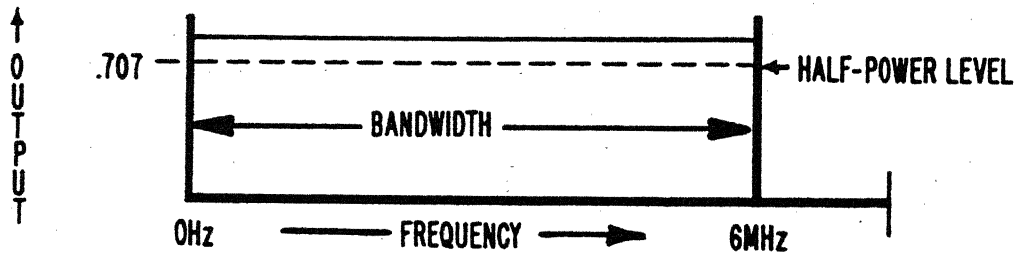


FIGURE 1

IDEAL VIDEO AMPLIFIER RESPONSE CURVE

Figure 2 shows the typical response curves for actual transformer-coupled and resistance-capacitive (RC) coupled amplifiers.

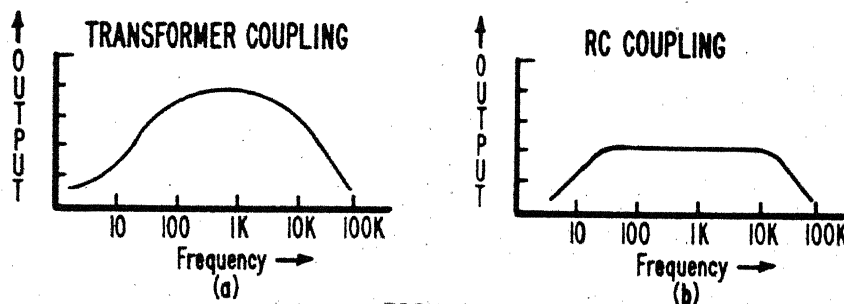


FIGURE 2

AMPLIFIER RESPONSE CURVES

Although RC coupled amplifiers provide the wider bandwidth, they fall short of the wide bandwidth requirements of video amplifiers.

Figure 3 can be referenced to show what limits video amplifier low frequency response.

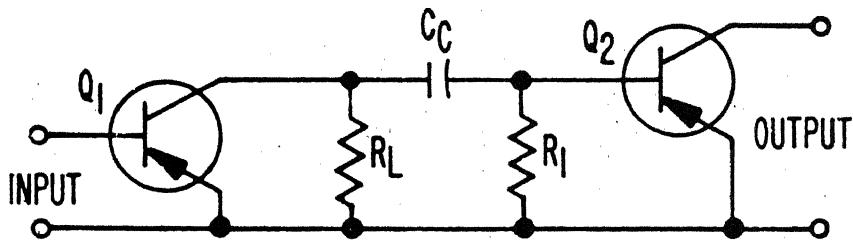


FIGURE 3

AC EQUIVALENT-RC COUPLED AMPLIFIER

At low frequencies, the capacitive reactance (X_c) of C_c is relatively high causing some signal voltage to drop across C_c instead of across R_1 . Thus, less voltage is felt across R_1 which reduces overall amplifier gain at low frequencies.

One method to partially compensate for low frequency response loss is to use a larger value coupling capacitor. Another type of method is to add the RC network shown in Figure 4.

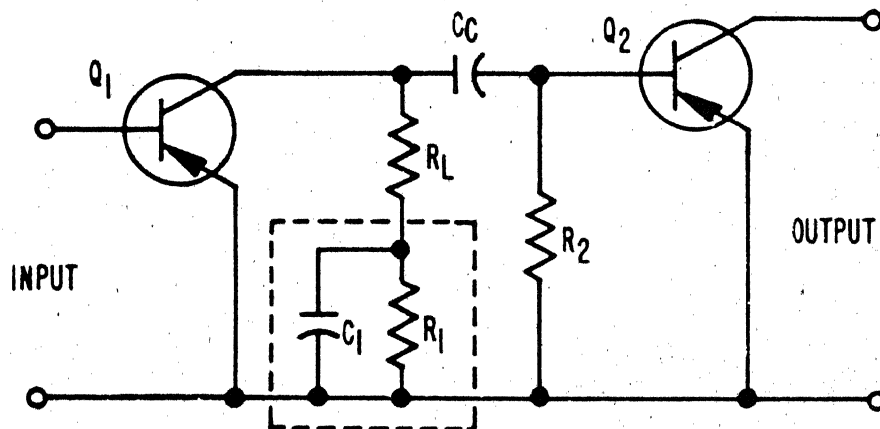


FIGURE 4

AC EQUIVALENT - LOW FREQUENCY COMPENSATION CIRCUIT

At low frequencies, the X_c of C_1 is large enough so that C_1 acts as an open. Therefore, the RC network has an impedance equal to R_L . This makes the total load impedance for Q_1 equal to $R_L + R_1$, which increases amplifier gain by compensating for the C_c voltage drop. At high frequencies, C_1 acts to short the RC network, which returns the gain from Q_1 to that produced by R_L alone. Another method for amplifying low frequencies uses DC (direct coupling) between stages. This method will be seen in Module 34.

Figure 5 shows what limits video amplifier high frequency response.

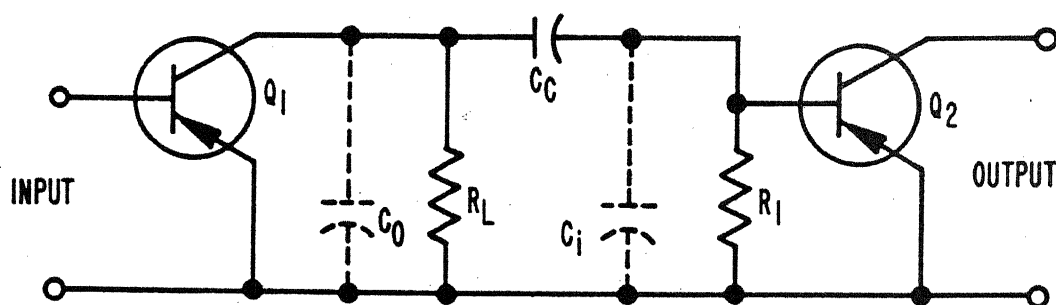


FIGURE 5

AC EQUIVALENT - STRAY CAPACITANCE

The input and output stray capacitances C_0 and C_i have low reactances at high frequencies, and shunt the signal to ground. These stray capacitances result from the close spacing between wires, foils, components, and the input/output capacity of active devices.

One method to compensate for high frequency signal loss is to place an inductor in parallel with C_o and C_i as shown in Figure 6.

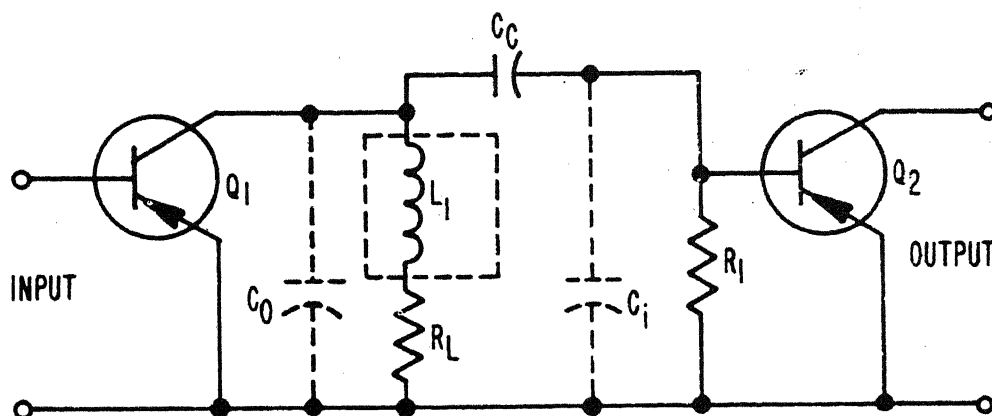


FIGURE 6

"SHUNT" HIGH FREQUENCY COMPENSATION (AC EQUIVALENT)

At high frequencies, C_o , C_i and L_1 form a parallel resonant circuit which, at resonance, develops an increased output impedance from Q_1 . This type of high frequency compensation is called shunt compensation, or shunt peaking. The shunt compensation circuit has a wide bandwidth, and an F_o above the frequency response of the uncompensated amplifier circuit.

Shunt type compensation may not improve the high frequency response of video amplifiers enough for some applications. The circuit can be further improved by adding an inductor in series with the signal path and C_i as shown in Figure 7.

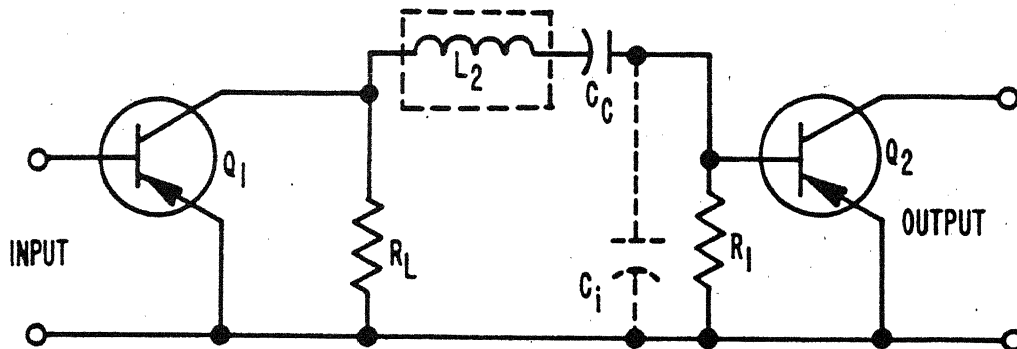


FIGURE 7

"SERIES" HIGH FREQUENCY COMPENSATION (AC EQUIVALENT)

At high frequencies, the combination $L_2 - C_i$ forms a series resonant circuit to the signal path. At resonance, the impedance in this LC circuit is at a minimum and the voltage across the reactive components are at a maximum. Therefore, the voltage developed by C_i is maximum at F_o and will be felt across R_1 and fed to the base of Q_2 . This method of increasing amplifier gain is called series compensation, or series peaking. If the value of L_2 is chosen properly, the F_o of the series compensation circuit will occur above the frequency response of the shunt compensation circuit. This will further increase the amplifier's frequency response.

Figure 8 shows the frequency response curve for a video amplifier with combined low and high frequency compensation added.

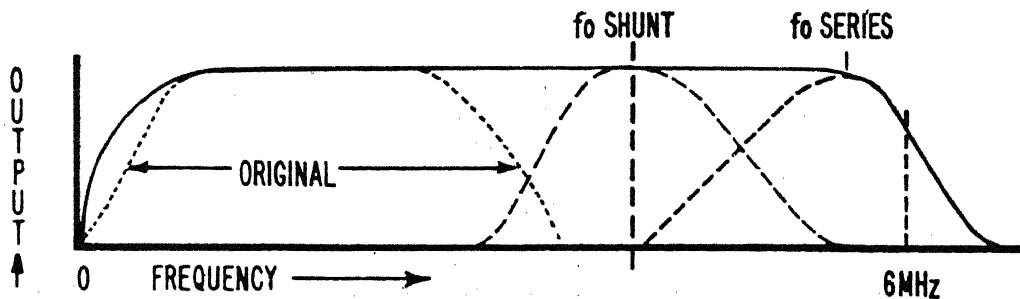


FIGURE 8

COMPENSATED VIDEO AMPLIFIER RESPONSE

This fully compensated RC coupled video amplifier has a frequency response from about 30 Hz to 6 MHz.

Figure 9 shows the schematic diagram of a two-stage video amplifier as found in the NIDA trainer. A description of component functions follows.

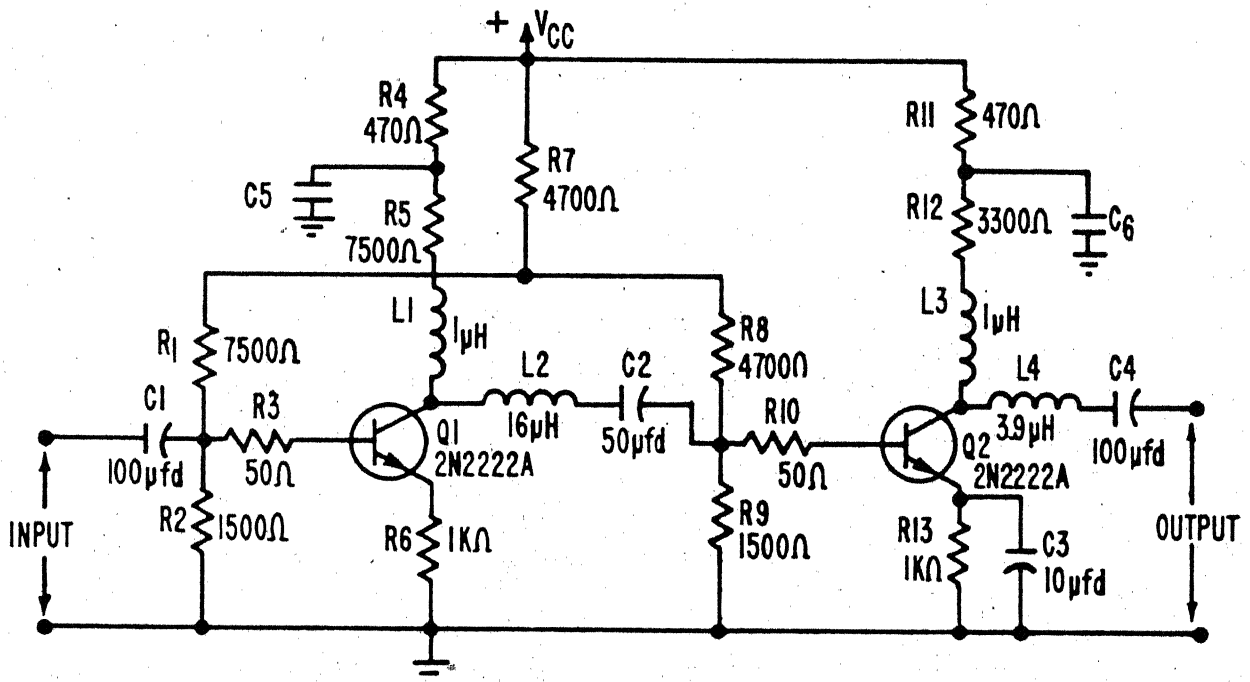


FIGURE 9

2-STAGE VIDEO AMPLIFIER-ACTUAL CIRCUIT

Class A forward bias is provided for Q1 by R1 and R2, and for Q2 by R8 and R9. R7 completes the voltage divider from Vcc with these networks. Emitter stabilization is provided by R6 and R13. R13 is bypassed by C3 to prevent degeneration and loss of gain. R6 is not bypassed to improve low and high frequency response at the cost of some gain.

The interstage video signal coupling C1, C2, and C4 have large values to improve low frequency response. The R4-C5 and R11-C6 decoupling components separate the signal path from the DC power supply, and prevent the amplifier from becoming an oscillator. The shunt high frequency peaking coils L1 and L3 are connected to the normal collector load resistors R5 and R12. The series high frequency peaking coils are L2 and L4.

R10 acts to reduce the Q, and broaden the bandwidth, of the L2-Ci series compensation network. R3 acts to perform a similar function in a previous amplifier stage.

The frequency response for a video amplifier can be measured using a sweep frequency generator as shown in the test set-up in Figure 10.

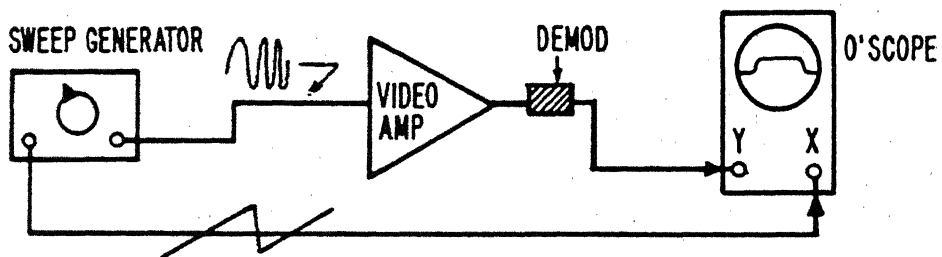


FIGURE 10

VIDEO AMPLIFIER FREQUENCY RESPONSE TEST

If the generator is set to sweep from 0 Hz to 10 MHz, the output signal from a test amplifier would resemble the display on the oscilloscope shown in the figure. A technician can troubleshoot the video amplifier by comparing the actual frequency response curve with the expected normal frequency response curve. Deficiencies in either high or low frequency responses indicate which components may be faulty.

The frequency response for a video amplifier also can be measured using a square wave generator as shown in the test set-up in Figure 11.

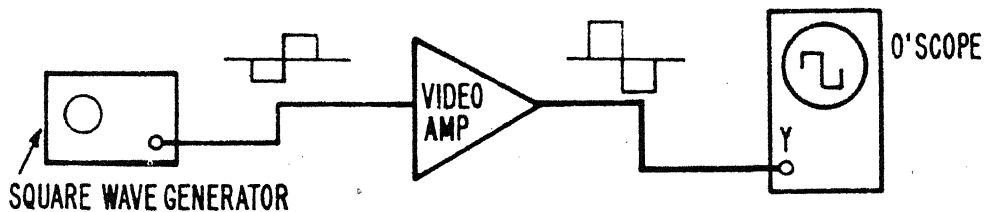


FIGURE 11

SQUARE WAVE-AMPLIFIER TEST

Accurate reproduction of the square wave indicates good frequency response in a video amplifier. Any distortion of the square wave indicates a problem in frequency response.

In theory, a square wave is the result of combining a fundamental sine wave frequency with an infinite number of odd-numbered harmonic frequencies. In practice, a video amplifier which accurately reproduces a square wave is capable of amplifying a fundamental frequency and at least the first 10 odd-numbered harmonics. The display produced by a video amplifier with good and poor frequency responses are shown in Figure 12.

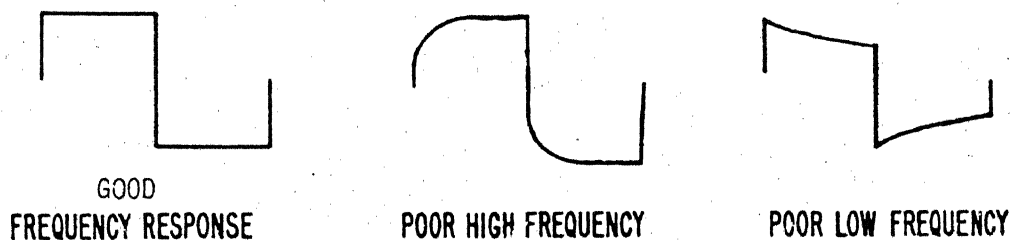


FIGURE 12

SQUARE WAVE DISPLAYS AND FREQUENCY RESPONSE

You will have the opportunity to operate and troubleshoot a video amplifier in the Job Program for this lesson.

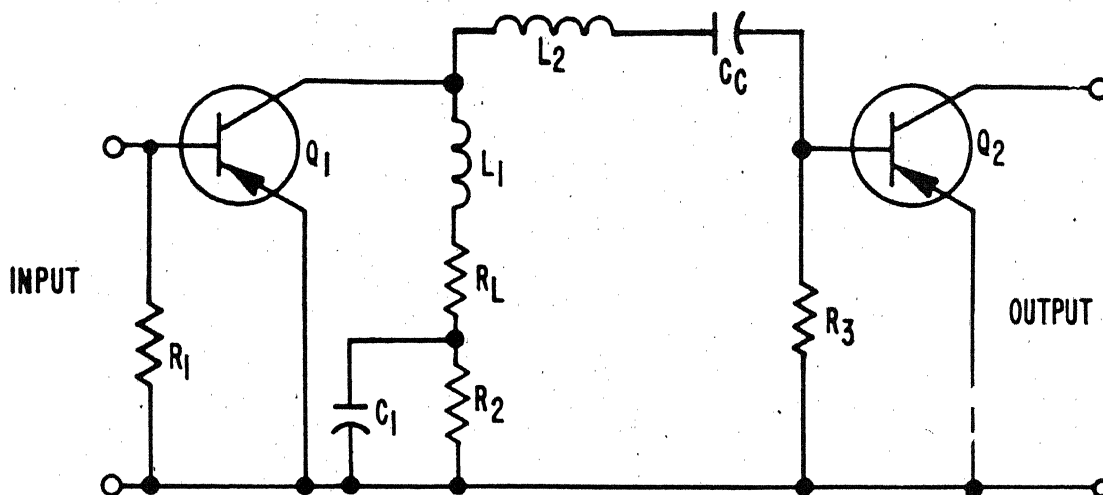
AT THIS POINT, YOU MAY TAKE THE LESSON PROGRESS CHECK. IF YOU ANSWER ALL SELF-TEST ITEMS CORRECTLY, PROCEED TO THE JOB PROGRAM. IF YOU INCORRECTLY ANSWER ONLY A FEW OF THE PROGRESS CHECK QUESTIONS, THE CORRECT ANSWER PAGE WILL REFER YOU TO THE APPROPRIATE PAGES, PARAGRAPHS, OR FRAMES SO THAT YOU CAN RESTUDY THE PARTS OF THIS LESSON YOU ARE HAVING DIFFICULTY WITH. IF YOU FEEL THAT YOU HAVE FAILED TO UNDERSTAND ALL OR MOST OF THE LESSON, SELECT AND USE ANOTHER WRITTEN MEDIUM OF INSTRUCTION, AUDIO/VISUAL MATERIALS (IF APPLICABLE), OR CONSULT WITH THE LEARNING CENTER INSTRUCTOR, UNTIL YOU CAN ANSWER ALL SELF-TEST ITEMS ON THE PROGRESS CHECK CORRECTLY.

PROGRESS CHECK
LESSON 4

Video Amplifiers

1. In an RC coupled amplifier, low frequency losses are caused by the (increased/decreased) voltage drop across the interstage _____.
2. In an RC coupled amplifier, the spacing between wires and components at high frequencies causes
 - a. signal instability in the coupling capacitor
 - b. an increase in amplifier frequency response
 - c. the loss of high frequency amplification
 - d. an increase in the center frequency of the amplifier

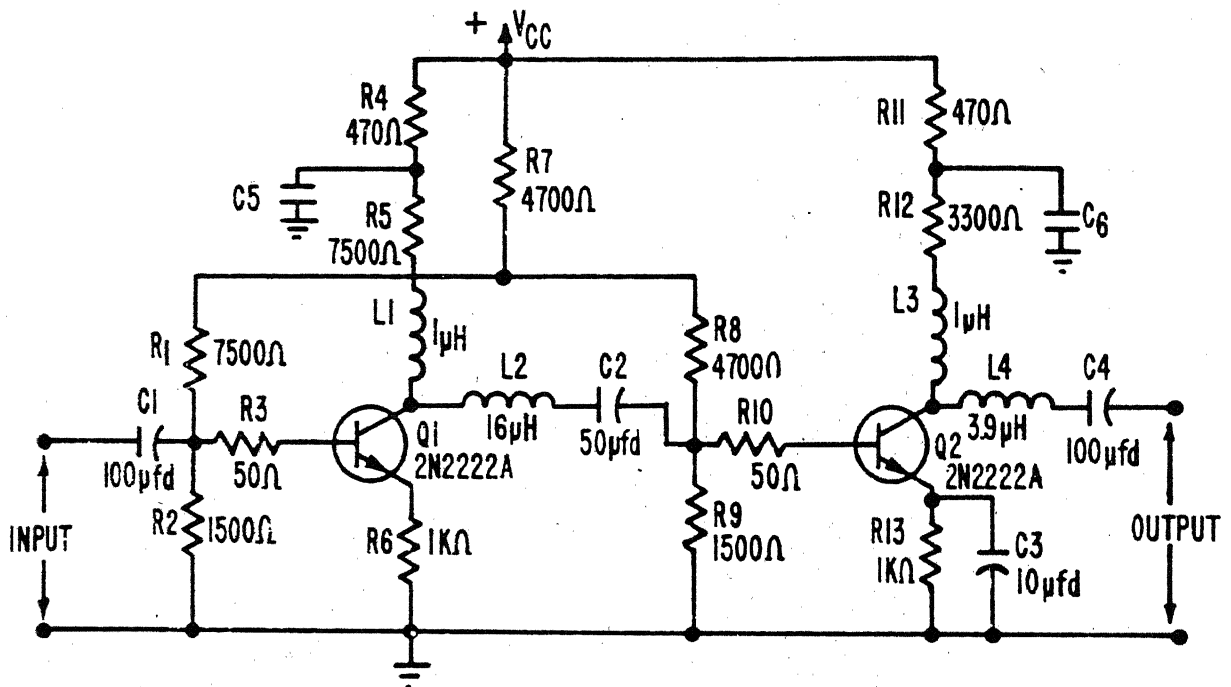
USE THE DIAGRAM BELOW OF AN AC EQUIVALENT, TWO-STAGE VIDEO AMPLIFIER CIRCUIT TO ANSWER QUESTIONS 3 THROUGH 6.



3. Low frequency compensation is provided by components _____ and _____.
4. High frequency compensation is provided by components _____ and _____.

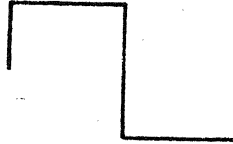
5. At low frequencies, the load impedance of Q1 is increased by the additional resistance of
- RL
 - R1
 - R2
 - R3
6. Series high frequency compensation is provided by the inductance of L1, L2 and the capacitance of Cc, Cin.

USE THE DIAGRAM BELOW OF A TWO-STAGE VIDEO AMPLIFIER CIRCUIT TO ANSWER QUESTIONS 7 THROUGH 9.



7. Shunt peaking is provided by components _____ and _____.
8. Class A forward bias is provided to the second stage by components
- R7, R8, and R9
 - R11, R12, and R13
 - R9 and R10
 - R10 and R13
9. Amplifier oscillation in the first stage is prevented by components _____ and _____.

USE THE FIGURE BELOW TO ANSWER QUESTION 10.



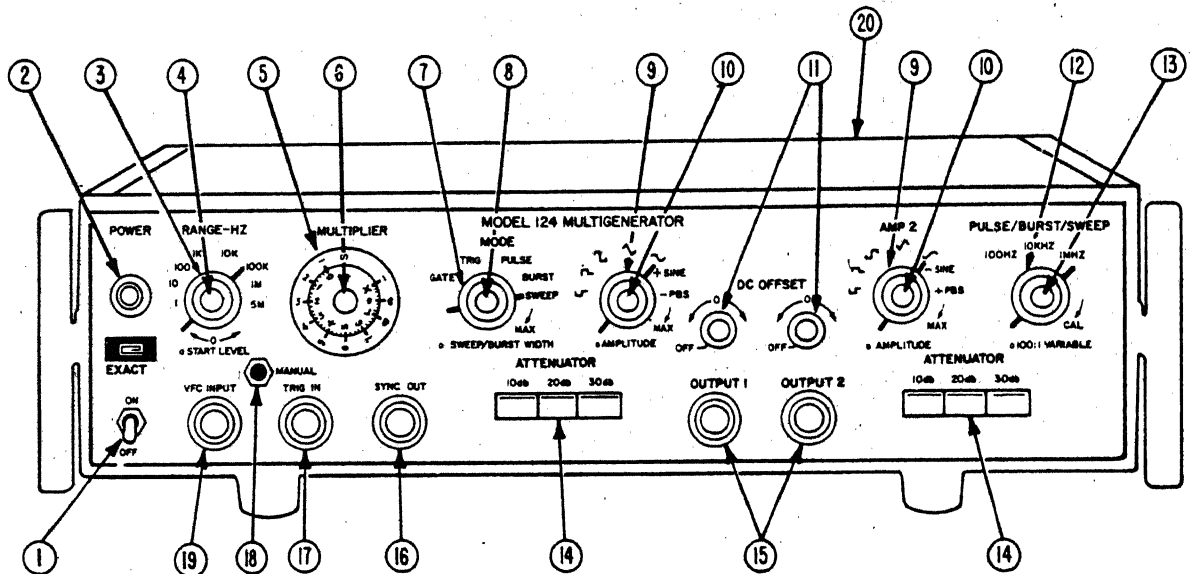
10. The figure shows the output signal from a video amplifier with a square wave input. The output signal indicates that the frequency response is _____ at low frequencies and _____ at high frequencies.
- a. good, good
 - b. good, poor
 - c. poor, good
 - d. poor, poor

CHECK YOUR RESPONSES TO THIS PROGRESS CHECK WITH THE ANSWER SHEET. IF YOU ANSWER ALL SELF-TEST ITEMS CORRECTLY, PROCEED TO THE JOB PROGRAM. IF YOU INCORRECTLY ANSWER ONLY A FEW OF THE PROGRESS CHECK QUESTIONS, THE CORRECT ANSWER PAGE WILL REFER YOU TO THE APPROPRIATE PAGES, PARAGRAPHS, OR FRAMES SO THAT YOU CAN RESTUDY THE PARTS OF THIS LESSON YOU ARE HAVING DIFFICULTY WITH. IF YOU FEEL YOU HAVE FAILED TO UNDERSTAND ALL OR MOST OF THE LESSON, SELECT AND USE ANOTHER WRITTEN MEDIUM OF INSTRUCTION, AUDIO/VISUAL MATERIALS (IF APPLICABLE), OR CONSULT WITH THE LEARNING CENTER INSTRUCTOR, UNTIL YOU CAN ANSWER ALL SELF-TEST ITEMS ON THE PROGRESS CHECK CORRECTLY.

INFORMATION SHEET LESSON 4

Exact Model 124 Multigenerator

The Exact Model 124 Multigenerator is a combination SINE, SQUARE, TRIANGLE, SWEEP, TONEBURST, and PULSE GENERATOR in one compact and versatile package. It is a signal generator used to troubleshoot and align RF, IF, Video and Audio circuits. You can see the importance of this if you are troubleshooting a radar set. You would need an RF signal generator, a square wave generator for your video circuits, an audio oscillator for your master timer, etc. All these generators are given to you in one compact package.



**FIGURE 1
FRONT PANEL MODEL 124**

FUNCTION OF CONTROLS, SWITCHES AND CONNECTORS

Refer to Figure 1 for the below listed controls and connectors.

1. Power Switch - Turns instrument On and Off.
2. Power Indicator Lamp - Visual indication when power is On.

3. Range Switch - Selects desired frequency range.
4. Start Level - Varies the lockout level or phase of the triangle and sine waveforms with respect to the square wave.
5. Multiplier Dial - Provides calibrated fixed steps between range settings. Each step equals 10% of range. The "S" position places the generator in the Search mode.
6. Multiplier Vernier - Allows variable adjustment of frequency between fixed steps of the Multiplier dial.
7. Mode Switch - Selects main generator modes of operation.
8. Sweep/Burst Width - Controls sweep width when in sweep mode and burst width in burst mode.
9. Function Switch, Amp 1 and Amp 2 - Selects the desired function.
10. Amplitude, Amp 1 and Amp 2 - Provides 20 dB variable attenuation of the output amplitude.
11. D.C. Offset Switch - The Off position disables the offset potentiometer. The offset potentiometer manually adjusts the D.C. reference of the output waveform selected by the Function switch.
12. Pulse/Burst/Sweep Switch - Selects desired frequency of Pulse/Burst/Sweep Generator.
13. 100:1 VAR - Provides 100:1 variable frequency to cover all frequencies between 1 MHz and 1 Hz.
14. Attenuator, Amp 1 and Amp 2 - Selects desired amount of attenuation at Amp 1 or Amp 2 outputs. Pushbutton attenuators provide 10 dB steps (adding) to 60 dB.
15. Output Jack, Amp 1 and Amp 2 - 50 Ω output jack for all waveforms selected by the Function switch.
16. Sync Out - Provides Sync pulse for external equipment. Sync pulse is coincident with internal square wave.
17. Trig In - Provides input for external gating and triggering signals for the main generator.
18. Manual Pushbutton - Provides manual gating and triggering signal.
19. VCF Input - Provides external input for voltage control of frequency or sweeping.

JOB PROGRAM
FOR
LESSON IV

Video Amplifiers

INTRODUCTION

This Job Program is designed to permit you to analyze the operation of video amplifiers and to see the results of high frequency compensating networks. It will reinforce your knowledge of the video amplifiers you studied in the narrative, programmed instruction or summary. All voltages and resistances measured should be within $\pm 20\%$ tolerance with those given in the answer sheet to the job program.

SAFETY PRECAUTIONS:

Observe all standard safety precautions. Beware of all open and exposed connections; an energized circuit may have dangerous voltages present.

EQUIPMENT AND MATERIALS

1. Oscilloscope-Single Trace
2. Exact 124 Multigenerator
3. NIDA 205 Transceiver Trainer
4. Video Amplifier PC 205-5V
5. 1X Probe TEKTRONIX P6028
6. BNC-BNC Connector Cable (1 long)
7. Shorting Wire with two Alligator Clips
8. Schematic Diagram of the PC 205-5V
9. BNC-Alligator Clip Cable

PROCEDURES

1. Remove the top cover from the NIDA 205 Transceiver Trainer. Remove all printed circuit boards from the chassis.
2. Insert the PC205-5V printed circuit board in the PC 205-5 position.
3. Refer to the schematic diagram of the PC 205-5V (fold out page).
4. Set up the multigenerator as follows:
 - a. Set the Range-Hz switch to 10 kHz. Set the start level control to mid-range.
 - b. Set the multiplier switch to position 4. Set the vernier control in the center of the Multiplier switch to position 4. Use this control in conjunction with the oscilloscope stability control to stabilize the sweep.
 - c. Set the Mode switch to the "SWEEP" position. Set the Sweep/Burst/Width control fully CCW.
 - d. Set the "AMP 1" switch to the third position from fully CCW. Set the Amplitude control fully CCW.
 - e. Set both DC offset controls to mid-range.
 - f. Set the Attenuator switches for an attenuation of the signal by 20 dB. This will prevent overdriving the input amplifier stage of the video amplifiers.
 - g. Set the PULSE/BURST/SWEEP switch to 1 MHz. Set the 100:1 variable control to the "cal" position.
 - h. Connect a BNC-Alligator cable to the "Output 1" jack.
5. Set up the oscilloscope as follows:
 - a. Set the Display Mode switches for channel #1 operation.
 - b. Set the Volts/Div control for channel #1 to the .2 position.
 - c. Set the Time/Div control to 50 usec.
 - d. Set the Triggering level and stability controls to mid-range.
 - e. Set the Trigger source switch to "INT."
 - f. Set all other switches to the "AC" position.
 - g. Connect a 1X probe to the channel #1 input of the oscilloscope.

6. Connect the 1X probe to the alligator clip lead from the multigenerator and turn on the equipment. Note: Ground connections must be observed. Adjust amplitude control for 0.18 Vp-p.
7. Refer to step #4b above. Manipulate the vernier control on the multigenerator and the stability control on the oscilloscope until you obtain a stable presentation.
8. Using the oscilloscope, measure the amplitude of the waveform shown _____. This signal will be used as the input to the 2 stage video amplifier circuit board.

NOTE: In all cases involving the use of various types of signal generators it is very important that the signal being supplied by the generator never be permitted to exceed the bias on the transistor or severe distortion and inaccurate presentations will result.

9. Connect the BNC - alligator clip cable from the multigenerator to the top of C1 in the video amplifier and the 1X probe from the oscilloscope to the bottom of L1. This is the collector of Q1. Energize the NIDA 205 Transceiver Trainer.
 - a. Measure the amplitude of the signal on the scope _____.
 - b. Calculate the gain of the amplifier using the information obtained in step #8 and step #9a _____.
 - c. Study the schematic diagram and try to figure out why the gain of the circuit is so low _____.
10. Turn the channel #1 Volts/Div control on the scope to the .5 position.
11. Deenergize the NIDA 205 Transceiver Trainer.
12. Notice the 10 μ f capacitor with one end soldered to the bottom of R6. Connect the shorting wire with the two alligator clips between the unconnected end of this capacitor and the top of R6. You have now provided an emitter bypass capacitor for the first video amplifier stage.
13. Energize the NIDA 205 Transceiver Trainer.
 - a. What happened to the gain? _____.
 - b. What happened to the low frequency response? _____.

NOTE: Now you can see that an emitter bypass capacitor will increase the gain of an amplifier stage and if the emitter bypass capacitor should open, the amplifier gain will be very low. REMEMBER THIS. It is very important in troubleshooting.

14. Deenergize the NIDA 205 Transceiver Trainer.
15. Remove the shorting wire from the capacitor.

16. Energize the NIDA 205 Transceiver Trainer.
17. Connect the oscilloscope probe to the top of the output capacitor at pin #7.

NOTE: There is a 1000 pf capacitor at the lower right hand corner of the PCB connected to pin #12. The purpose of this capacitor, which is NOT a part of the circuit is to show you what happens to your high frequency response when the peaking coils are bypassed to ground.

18. Change the controls on the multigenerator as follows:
 - a. Set the Range-Hz control to 100 K.
 - b. Set the multiplier control to position 3.
 - c. Remove all signal attenuation by setting all attenuator switches to the "out" position.
 - d. You may vary the vernier control in the center of the multiplier for a stable presentation after setting up the oscilloscope.
19. Change the settings on the oscilloscope as follows:
 - a. Change the channel #1 Volts/Div control to 5.
 - b. Change the Time/Div control to 10 usec.
20. Deenergize the NIDA 205 Transceiver Trainer.
21. Using the shorting wire with the two alligator clips, connect 1 clip to the 1000 pf capacitor lead and the other clip to the bottom of L3.
22. Energize the NIDA 205 Transceiver Trainer and notice the effect on the waveform on the scope.
 - a. What happened to the high frequency response? _____.
23. Go through the procedures listed in steps #20, #21 and #22 except connect the capacitor to the bottom of L4 and view the waveform on the scope.

NOTE: In most cases using transistorized circuitry, it is impossible for a technician to measure voltages directly on the emitter, base or collector of a transistor; therefore you must place your meter lead on the end of the component which is connected to these elements.

24. Using the information given in the above note, measure the DC voltages on the emitter, base and collector of Q1 and Q2, and check these voltages with voltage/waveform chart at the end of this lesson.
25. Attenuate the signal from the multigenerator by a factor of 20 dB.

26. Connect a BNC-BNC cable from the "sync out" jack on the multigenerator to the trigger source jack on the oscilloscope. The purpose for this is so you can see the phase reversal of the amplifiers.
27. Set the trigger source switch on the oscilloscope to "EXT."
28. Using the 1X probe from the oscilloscope trace the signal through each transistor. Notice the phase shift between input and output. Compare your waveforms with the waveforms in the voltage/waveform chart at the end of this lesson.
 - a. Calculate the gain of Q2 _____.
 - b. Calculate the total gain of the video amplifiers _____.

NOTE: You have now completed the Job Program for video amplifiers. You have seen how shunt and series high frequency compensating coils (peaking coils) effect the operation of a video amplifier and how an emitter bypass capacitor effects the operation of a circuit.

CHECK YOUR RESPONSES TO THIS JOB PROGRAM WITH THE ANSWER SHEET. IF YOUR RESPONSES AGREE WITH THE ANSWER SHEET, YOU MAY TAKE THE LESSON TEST. IF YOUR RESPONSES DO NOT AGREE OR IF YOU FEEL YOU HAVE FAILED TO UNDERSTAND ALL OR MOST OF THIS JOB PROGRAM, REVIEW THE PROCEDURES OF THIS JOB PROGRAM, ANOTHER WRITTEN MEDIUM OF INSTRUCTION, AUDIO/VISUAL MATERIALS OR CONSULT WITH THE LEARNING CENTER INSTRUCTOR, UNTIL YOUR RESPONSES DO AGREE.

INFORMATION SHEETS
FOR
TROUBLESHOOTING PERFORMANCE TEST

INTRODUCTION:

Using the following six step troubleshooting procedure will aid you in determining which component is faulty. In the split method of troubleshooting, the collector of Q1 has been selected as the starting point for this performance test. Based on your interpretation of the scope presentation at this point, you can determine which direction you should go.

EQUIPMENT:

1. NIDA 205 Transceiver Trainer
2. Oscilloscope-Single Trace
3. Exact 124 Multigenerator
4. NIDA PCB 205-5V Video Amplifier
5. Simpson 260 Multimeter and Test Leads
6. 1X P6028 Tektronic Probe
7. Schematic Diagram of NIDA PCB 205-5V Video Amplifier
8. BNC-Alligator clip cable

INSTRUCTIONS:

1. Each student is required to determine the defective component in a prefaulted video amplifier circuit board. Your six-step troubleshooting sheet must indicate you used accurate test measurements and a logical procedure to find the faulty component.
2. Standard test equipment will be available to you in the form of an oscilloscope, a multigenerator, and a Simpson 260 multimeter. You will be expected to observe all safety precautions throughout the test. A safety violation will result in an automatic failure of the performance test. In that event you will be counselled and given remedial training.
3. You will take a numbered position in the test room. After briefing by the Learning Center Instructor you will fill out the heading of the troubleshooting form. On a signal from the Learning Center Instructor you will then start the test. If at any time during the test you should require assistance, raise your hand. DO NOT LEAVE YOUR POSITION. A Learning Center Instructor will assist you with your trouble.

4. You must identify the faulty component to pass this performance test.
5. If you do not understand these instructions raise your hand and ask your Learning Center Instructor. If you do understand these instructions and upon a signal from your Learning Center Instructor you may now begin the Performance Test on the next page.

NOTE: You may remove the circuit board from the NIDA trainer to make resistance checks.

TROUBLESHOOTING PERFORMANCE TEST

DIRECTIONS:

DO NOT WRITE IN THE PERFORMANCE TEST BOOKLET. MAKE ALL YOUR RESPONSES ON THE SIX STEP TROUBLESHOOTING SHEET SUPPLIED WITH THE TEST PACKET. THIS PERFORMANCE TEST BOOKLET IS DESIGNED TO AID YOU IN COMPLETING THE STANDARD SIX STEP TROUBLESHOOTING FORM. COMPLETE THE STEPS USING YOUR KNOWLEDGE AND SKILL OF THE CIRCUITS SHOWN. CONTACT YOUR LEARNING CENTER INSTRUCTOR IF YOU HAVE ANY QUESTIONS.

SET UP THE EQUIPMENT THE SAME AS YOU DID IN THE JOB PROGRAM. ALL WAVEFORMS, VOLTAGES AND RESISTANCES WILL BE MEASURED WITH REFERENCE TO GROUND UNLESS THE PCB IS REMOVED TO MEASURE FRONT TO BACK RESISTANCE RATIOS OR TO MEASURE THE RESISTANCE OF A SPECIFIED RESISTOR. ALL MEASURED VOLTAGES AND RESISTANCES SHOULD BE WITHIN $\pm 20\%$ TOLERANCE WITH THOSE GIVEN IN THE VOLTAGE/RESISTANCE CHART AT THE END OF THIS PERFORMANCE TEST.

STEP ONE - SYMPTOM RECOGNITION

1. Does the equipment energize? _____ yes/no.

STEP TWO - SYMPTOM ELABORATION

2. No symptom elaboration. Proceed to step 3. Front panel meter is not in the circuit.

STEP THREE - LIST THE PROBABLE FAULTY FUNCTION(S)

1. First and second Video amplifiers.

STEP FOUR - LOCALIZE THE FAULTY FUNCTION

1. Verify the probable faulty function by use of test equipment.
2. List the test points where voltages/waveforms were obtained
3. Reference voltages/waveforms/resistances are listed in the voltage/waveform/resistance chart.
4. Be sure you list the reference voltage/resistance on the troubleshooting sheet for each measurement you make.

TROUBLESHOOTING PERFORMANCE TEST

STEP FIVE - LOCALIZE THE FAULTY CIRCUIT/COMPONENT

1. List the test points where actual voltages were taken.
2. What circuit/component in the faulty function listed in step four is faulty?
3. If you have determined the faulty circuit but not the faulty component proceed to part four.
4. Secure the power and using the Simpson 260 take resistance checks.
 - a. Check front to back ratios on diodes.
 - b. Continuity checks on printed circuit board foil.
 - c. Capacitors can be shorted or open.
 - d. Resistors can be open.

STEP SIX - FAILURE ANALYSIS

Explain in your own words why the component listed in steps five or six above would cause the symptoms listed in steps one and two of the six step troubleshooting procedure? Write your answer in the space provided on the troubleshooting form.




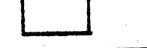


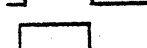
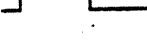
TAKE YOUR SIX STEP TROUBLESHOOTING SHEET TO YOUR LEARNING CENTER INSTRUCTOR FOR VERIFICATION AND EVALUATION.

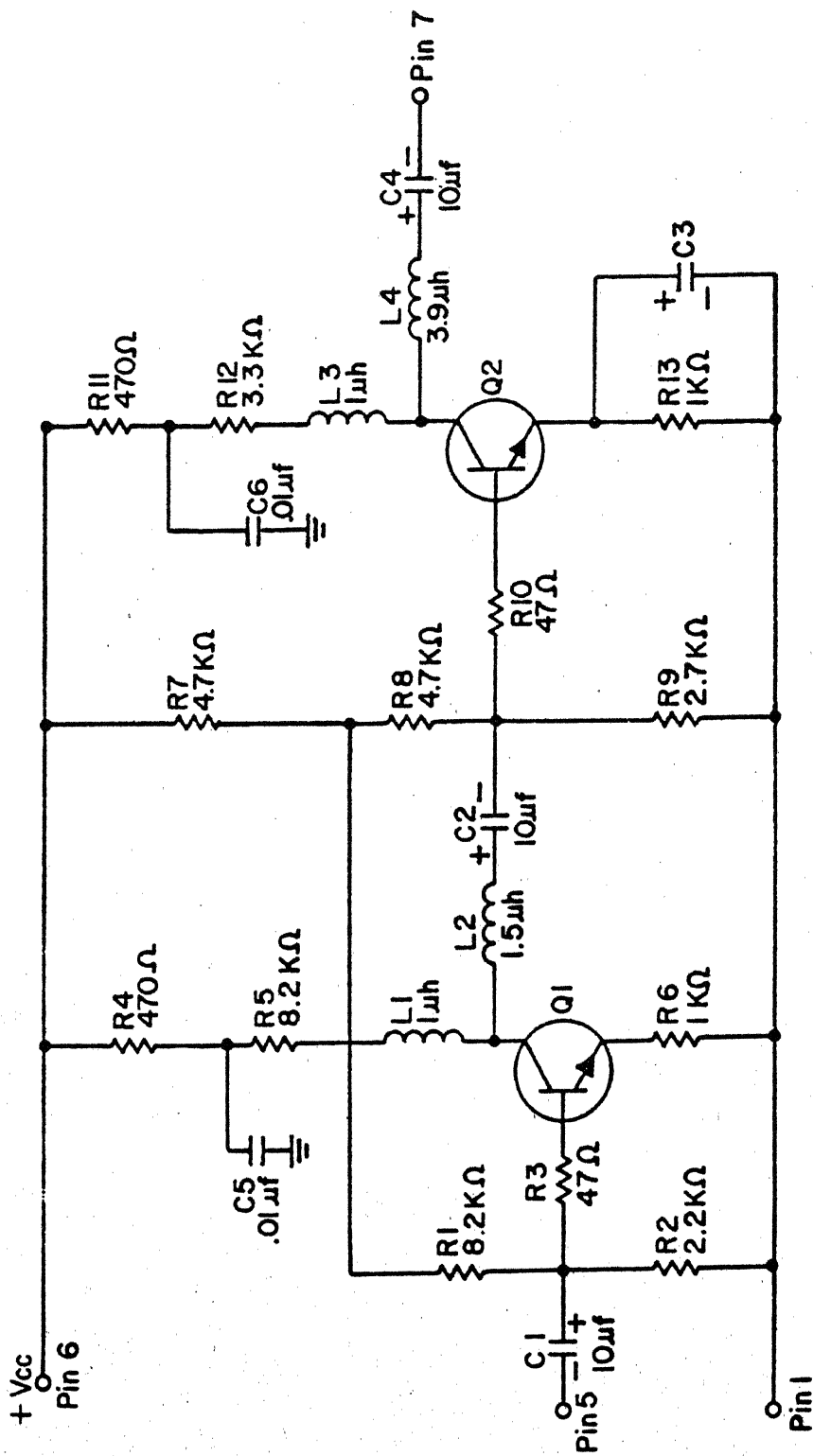
TROUBLESHOOTING

FOR

VOLTAGE/RESISTANCE/WAVEFORM CHART

The following voltages, resistances and waveforms were taken with a Simpson 260 multimeter and an oscilloscope with the scope and the multigenerator set up according to the instructions in the job program, steps #17, #18, #19 and #25 through #28. The output from the multigenerator is connected to Pin #5 of the video amplifier and the output is taken from Pin #7 of the video amplifier. All voltages, resistances and waveforms were taken with respect to ground or circuit common.

<u>Point of Check</u>	<u>Voltage</u>	<u>Resistance</u>	<u>Waveform</u>
Pin #6	10.2 VDC	1.9 K ohms	 10.2 VDC
V _B Q1	1.0 VDC	1.4 K ohms	 0.18 V
V _E Q1	0.48 VDC	1 K ohm	 0.16 V
V _C Q1	6.4 VDC	12 K ohms	 0.2 V
V _B Q2	1.67 VDC	1.4 K ohms	 0.2 V
V _E Q2	1.25 VDC	1 K ohm	 0.02 V
V _C Q2	5.8 VDC	6.5 ohms	 9.5 V
Pin #7	0 VDC	850 K ohms	 9.5 V



PC 205-5V

VIDEO AMPLIFIERS

ANSWER SHEET FOR
PROGRESS CHECK
LESSON 4
Video Amplifiers

QUESTION No.

CORRECT ANSWER

- | | |
|-----|---|
| 1. | increased,
coupling capacitor |
| 2. | c. the loss of
high frequency
amplification |
| 3. | C1, R2 |
| 4. | L1, L2 |
| 5. | c. R2 |
| 6. | L2, C _{in} |
| 7. | L1, L3 |
| 8. | a. R7, R8, and R9 |
| 9. | R4, C5 |
| 10. | a. good, good |

ANSWER SHEET
FOR
JOB PROGRAM
LESSON 4

Video Amplifiers

- 8. .18 V P/P
- 9a. .22 V P/P
- b. 1.22
- c. Unbypassed emitter resistor
- 13a. Increased
- b. Decreased
- 22a. Decreased
- 28a. 22.6
- b. 26.4